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## A Basis for the Reconsideration of Wastes and Losses in Food Marketing

By Harry Sherr

*Many studies have been made of wastes and losses in the marketing of food and of the possibility of their reduction. Some have focused on technological aspects, others on the failure to satisfy consumer needs. This paper uses a fresh approach by stressing the economic aspects of the problem—the costs in basic production resources and alternative costs in marketing resources involved in reducing wastes and losses.*

FOOD PRODUCED by farmers in the United States reaches consumers through a vast, complicated, and relatively efficient system of distribution. Wastes and losses occur in the process of preparing and moving the tremendous volume of food through marketing channels, both because food is perishable in varying degree, and because of the separation in space and time between production and consumption. The wastes and losses that do occur represent unintended use of production and marketing resources; to reduce them would require institutional changes or changes in production or in the marketing resources used.

Consideration of the problems of food-marketing wastes and losses needs some reorientation. In the past, the usual approach was characterized by measuring what goes into garbage pails. Emphasis on economic choices between alternative costs is likely to be more meaningful. Accordingly, decisions as to the changes that should be made in production and marketing to minimize wastes and losses might better be based on explicit economic analysis of marketing wastes and losses—including their relative magnitudes, indications of the major economic alternatives involved in reducing them, and consideration of the economic implications of the magnitudes and alternatives.

The basic economic alternative is whether it is less costly to accept wastes and losses or to make use of resources to reduce them. This and later choices among the available alternatives depend on combinations of several economic and

technological factors. The choices that are made frequently have important implications for farmers, marketing agencies, and consumers.

In this paper, the several objectives are: To clarify what is meant by wastes and losses in food marketing; to indicate what is known about them; to outline some of the major economic alternatives in reducing wastes and losses; and to discuss some of the economic implications of the choices involved.

### Wastes and Losses in Food Marketing

#### What Are They?

The interpretation of the phrase "wastes and losses in food marketing" varies among groups of people with differing interests. To *physical scientists*, they represent reductions in quantity or quality of the physical product arising from natural factors inherent in or external to the product, or to mechanical causes such as crushing or bruising. *Economists* view wastes and losses in terms of costs incurred versus alternative costs. More specifically, they view them (1) in macroeconomic terms of total farm and marketing resources<sup>1</sup> which may or may not be used most efficiently, the cost to the community or industry of making or not making changes to reduce wastes and losses, and consumer food needs which may be satisfied in varying degrees; and (2) in microeconomic terms of the operational alternatives available to

<sup>1</sup> Resources are measured by the value of the food commodity and the added value of marketing inputs.



the firm as it seeks to maximize returns and to the consumer as he seeks to maximize satisfactions.

To *businessmen*, wastes and losses represent (1) outlays for plant, machinery, and equipment required to keep wastes and losses at a minimum; (2) an element in the prices they pay or receive for food; and (3) a source of possible loss of consumer goodwill. To *consumers*, marketing wastes and losses of food may result in higher prices than necessary and possible dissatisfaction because of poor quality of the commodity. From the standpoint of *public policy*, the interest in marketing wastes and losses includes the objective of optimum returns from the use of economic resources to provide the domestic population with an adequate diet, in terms of nutrients and palatability.

### Why Do They Occur?

Wastes and losses of food in marketing occur chiefly for natural reasons and mainly among the more perishable foods, as the differences in space and time between the functions of production and consumption have continued to widen. Efforts of food marketing firms and Government agencies to reduce wastes and losses, including quality deterioration, have made it possible for many foods to be available in relatively large volume during most of the year throughout the United States.

Wastes and losses occur because food is, or was when harvested, a living form.<sup>2</sup> After food is harvested,<sup>3</sup> destruction from natural causes is hastened. Internally, this occurs because the cells break down and are not replaced with new, healthy cells; the commodity becomes vulnerable to attack from microorganisms, which it was able to withstand before harvest; or it deteriorates because of latent diseases, dehydration, or a combination of causes.

Meat, eggs, milk, and most fresh vegetables are particularly vulnerable, and start deteriorating immediately upon harvest unless the process is

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<sup>2</sup>The exception is milk, which comes from a living form.

<sup>3</sup>The meaning of the term "harvest" varies with the commodity. For meat, harvest occurs when the animal is slaughtered; eggs, when laid; milk, when drawn from cow; fruit, when picked from tree; food crops, when gathered, dug from the ground, or collected in various other ways.

(1) halted for an extended period by changing the form of the commodity—by canning, drying, freezing, pickling, salting, smoking, or irradiating—or (2) deterred by controlling temperature, humidity, and other environmental conditions. Depending on the stage of development and condition at time of harvest and in the market, fruits, melons, and tomatoes will go through a ripening phase before starting to decay.

Grains, dry edible beans, and dry field peas are among the less perishable foods that need not be changed in form for storage. If conditions are right<sup>4</sup> at time of harvest, marketing wastes and losses in these foods can be kept to a minimum at much less cost than for more perishable foods.

Marketing wastes and losses from natural causes include those caused by external factors—disease, insects, and rodents. Many of these can be controlled by biological and chemical sprays or baths, satisfactory storage conditions, and other means. Such measures of control are increasingly employed as new methods are applied or old ones are more widely used.

Damages arising from mechanical causes also lead to wastes and losses in the marketing of food. Included in this category are mishandling of the commodity, inadequate containers, improper packaging, and failure of machinery and equipment to function properly.

### Where Do They Occur?

Wastes and losses occur at all levels of food marketing channels, but they are discovered most often at certain points in the system. It is logical to expect their discovery to be concentrated (1) at or near the first point at which food enters marketing channels, because this is where the basic sorting and grading occurs most frequently; (2) at the time perishable commodities are moved out of storage; and (3) at the end of the marketing channel—mostly the retail store.

Sometimes the point in the marketing system at which waste and loss in an individual shipment of food occurs is determined by chance. Damage to fresh fruits and vegetables that is caused by a latent or a "market" disease can occur at almost any time. This will depend upon the degree of

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<sup>4</sup>"Right" weather conditions are those in which grains and other field crops can ripen properly before harvest.



success of man-made controls over environment in keeping disease in check in a particular situation. Whenever damage occurs, however, it may not be discovered until food containers are opened in a retail store. Because wastes and losses occur at all levels, analyses of individual commodities or of groups, by marketing channel, should be made at several stages in the distribution system and at several times for each stage in order to ascertain any patterns.

### What Is the Extent of Wastes and Losses?

Because we lack adequate statistical data, knowledge of the extent of wastes and losses of food in marketing is limited. Available data from various sources furnish us directly only a part of the total information needed—usually they are developed to meet individual or specialized accounting and statistical needs. For a more complete picture of wastes and losses, new data are required.

Data on wastes and losses are available from inspection reports of Federal Government agencies and others, food marketing studies, and reports of consolidated damage claim payments of some groups of freight carriers. These data are discussed in the next few paragraphs, together with some of their limitations. Mainly, this discussion examines the coverage of commodities or firms in the industry, the method of reporting, and definitions of waste or loss.

*USDA inspection records* are a good source of data on wastes and losses of red meats over several decades, and, beginning in 1959, of chicken and turkey meat, at the primary distribution level. All livestock slaughtered under Federal inspection and virtually all poultry meat that is intended for interstate commerce<sup>5</sup> must undergo an antemortem and postmortem inspection. Analysis of the consolidated inspection reports provides reliable data on wastes and losses of (1) animals and fowl between time of sale by grower and time of slaughter, and (2) meat at the primary stage in the marketing channel.

As a basic source of data for marketing wastes and losses, inspection reports for fresh fruits and vegetables are not as good as those for meats.

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<sup>5</sup>In 1959, production under Federal inspection was equivalent to about three-fourths of total production of meat and poultry, respectively.

Inspection of fresh fruits and vegetables is made only on request, and the request for inspection in terminal markets usually is made only when the first receiver believes that the quality of the produce has failed to meet specifications agreed upon between him and the shipper. On a rising or high market the receiver may tend to be a little more lenient as to whether specifications are met than he would in a declining or low market.

Individual *market research reports* issued by the U.S. Department of Agriculture and other researchers contain some information on wastes and losses of food in marketing, but they relate only to a specific commodity or group, at a specific level or function in the marketing channel, and during a specified period. Studies on the cost of retailing selected fresh fruits and vegetables in Pittsburgh during 1949-50, conducted by the Department, contain some data on wastes and losses. In connection with studies on the relocation of the wholesale food market in Detroit, New York City, and San Francisco, estimates were obtained on food wastes and losses in wholesale channels there.

Data on the value of claims paid on losses and damage in transit are available from *voluntary reports* furnished the *Association of American Railroads* and the *American Trucking Association* by their members. But only limited use can be made of these data because a good part of the perishable foods is transported by truckers who are not members of the ATA and do not report to the Association. Truckers of unmanufactured foods are exempt from Federal regulations other than those relating to safety and drivers' hours of service—they are not required to report on their operations to any Federal agency.

Consolidated data on claims payments cannot be converted directly to an equivalent physical quantity or other economically relevant basis because they are available for broad commodity groups only, and statistics on losses and quality deterioration are not reported separately. The reports include information only on claims paid. The amount paid on claims is frequently based on negotiation between the shipper and carrier and does not always reflect the full extent of the loss or damage. Then, too, at times when market supplies are relatively light and poor quality merchandise can be sold at a price that is satisfac-

tory to the shipper, loss and damage claims tend to be lower than during other periods.

### Some Major Economic Alternatives

The basic choice is whether to accept wastes and losses that accompany the movement of food to market or to attempt to reduce them. These decisions are continually made by food producers, processors, and distributors. When such a choice is possible, the selection is based on actual or anticipated relative costs and returns.<sup>6</sup> For some commodities, the choice may not be possible because of the current state of technology, lack of knowledge of technological possibilities, or the high costs involved.

Assuming that alternatives are available, an important choice involved in the determination that it pays to reduce wastes and losses in food marketing and the decision that it should be attempted may be whether to encourage the changes at the farm level or in the marketing system. These changes are technological or managerial, or some combination of the two. The various possible choices both as between changes at the farm and within the marketing system, and within each sector, are not mutually exclusive. The changes may come singly or in combination and over a relatively short or long period of time. For example, research is continually underway to develop disease-resistant varieties of muskmelons. At the same time, work is being done to reduce the incidence of physical damage to melons in the marketing process through the development of better containers and better methods of shipping and handling.

On the farm, the changes involve the development and expanded use by farmers of (1) species of livestock and varieties of crops which are more acceptable by the market and which will hold up better in the marketing process than did their predecessors, or (2) improved production (including harvesting) techniques which have the ultimate effect of reducing wastes and losses identified in the marketing system.

Minimizing wastes and losses within the food-marketing system involves one or more choices

among several actions. These actions, which are complementary rather than competing, include:

1. Investment in plant, machinery, and equipment.
2. Use of improved food containers and wrappers.
3. Improvement of management practices, such as better scheduling of merchandise receipts from suppliers and deliveries to customers, and more efficient utilization of available plant, machinery, equipment, and manpower.
4. Changes in marketing patterns and channels of distribution.
5. Production of new forms of food, such as acceptable manufactured forms of hitherto unmanufactured foods.
6. Engaging in research to develop or improve food products or to reduce marketing costs.

The decisions made by an individual marketing firm to increase its net return by reducing wastes and losses in food marketing (or the research undertaken for the purpose) are conditioned by the nature of the problem, the techniques and equipment available, and knowledge of the existence of these techniques.

Existing economic alternatives in the reduction of wastes and losses in food marketing are in fact not all equally available to all interested parties. Size of firm may be a factor. For some commodities, few individual firms are large enough to encourage directly those changes at the farm level that will reduce wastes and losses in marketing. This occurs in the production of vegetables under contract for canning or freezing. The contract terms may range from the one extreme in which the packer just obligates himself to buy at a prearranged price all or part of the output from the contracted acreage, to the other extreme in which the processor provides seed, fertilizer, machinery, production supervision, and labor in order to feel reasonably assured of obtaining the quantity of a particular quality of vegetable he wants to pack. An example in which size of firm would be a factor is when a large or a medium-sized firm may find it necessary, because of considerations of cost, to use automatic devices for handling commodities. A small firm may find it more economical to use manual equipment mainly because of a smaller physical volume of business.

<sup>6</sup>For the firm or industry, costs and returns are in monetary terms; for the Government—whether Federal, State, or local—they are in terms of public welfare.



## Some Economic Implications

Changes aimed at reducing wastes and losses in food marketing have economic implications for both agriculture and consumers in general, as well as for the food marketing industries. Both the agricultural and the nonagricultural sectors are affected economically by the basic decision as to whether to accept wastes and losses in food marketing. The decision is whether, and to what extent, to rely on factors of production in agriculture or in the marketing system to provide the additional supply of food needed by an increasing domestic population and by the world market. The answer to this is based largely on relative costs of farm and marketing resources.

It may be less expensive to accept wastes and losses in marketing and to depend on the expansion of production to supply increasing needs. With the amount of land available for commercial production of agricultural commodities likely to change little in the years ahead, expanded production of food can come about through changes in land use patterns, more efficient use of land, and improvements in both technology<sup>7</sup> and the ability of farmers to use the technology efficiently.

Over the years, technological developments in agriculture have resulted in more efficient production and better products, as well as in making an important impact on other sectors of the economy through the creation of a demand for specialized machinery and equipment and for synthetic fertilizers, to mention two examples. Some technological advancements have brought about a reduction of wastes and losses in marketing. Development of varieties of food crops that hold up better in the marketing process is one example.

The economic consequences of change for the purpose of reducing wastes and losses in food marketing depend largely on the objectives sought, the commodity involved, and the structure of the market. Basically, the objective sought

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<sup>7</sup> "Technology" is here used in its broadest sense, to include improved machinery and equipment; better fertilizers, insecticides, and pesticides; higher yielding crops; species of cows that are more efficient milk producers; species of meat animals that utilize feed and roughage efficiently in terms of producing a commercially desirable carcass in the shortest possible time, and so on.

is reduction of costs—labor or other inputs, product, or some combination of these. For the individual firm, the decision to make certain changes that may reduce wastes and losses has an important bearing on whether it will survive, and on its competitive position in the industry. An industry group may undertake research aimed at finding ways of reducing wastes and losses in order to enable the products handled by its members to compete more successfully with corresponding imports and with substitutes. From the public standpoint, among the important objectives are better use of available resources and the continued improvement of diets for an increasing civilian population.

The economic impact on agriculture of reductions in marketing wastes and losses varies with the commodity. It depends on the elasticity of both supply and demand for the item. For some, the reductions in waste and losses may result in an expansion of the market. An outstanding example is the impact of the development of frozen orange juice concentrate on the demand for oranges at the farm level. The development was a result of the continuing search for a processed orange juice that tasted like the fresh product, and that was more convenient to use than the fresh fruit and much less perishable.

Increased consumer use of frozen orange juice concentrate during the last decade largely reflects the combination of a number of factors. To some extent, consumers substituted the product for both fresh oranges and the various canned single-strength citrus juices, with the increase for the frozen juice more than offsetting equivalent reductions for the other two. The increase for the frozen orange juice concentrate reflected an expansion in both the per capita quantity used and the number of people using it. The net effect has been that over the last decade the market has been able to absorb considerably larger crops of oranges than the population increase alone would have warranted, and at prices that have encouraged growers in Florida to expand productive capacity for oranges.

For potatoes, reductions in wastes and losses have meant that less production was needed to meet consumer demand. However, the major impact on potato growers has been the long-term downtrend in per capita consumption of the fresh product.



Distribution of the benefits accruing from reductions in food-marketing wastes and losses by actions of marketing agencies depends on both the supply and the demand elasticities for the final product, the structure of the market with respect to competition, the extent to which knowledge of waste and loss reduction is spread within the industry, and the objective of the firm in making the change. These factors condition the extent to which the gains are retained by the firm, passed back to the farmer in the form of higher buying prices, or passed on to the consumer in the form of lower selling prices. For example, if only one firm possesses knowledge of how to reduce certain wastes and losses, it may retain the gains or pass them on, in part or in full, to consumers in an attempt to gain a larger share of the market. On the other hand, in another type of market situation, pressure of competition from other firms in the industry or other products may force the firm to pass the full benefits on to the consumer. In this situation, all the firm may hope to accomplish is to retain its share of the market.

The decision of the firm as to whether to make changes leading to reductions in food-marketing wastes and losses, the nature of the change—if any—and the timing of such a change may be spontaneous or induced. An example is the situation in which a processed form of a commodity is introduced when previously it was available only in the unprocessed form. The firm's decision as to whether it stands to gain anything by

marketing such a product, and the type of action to take, may be dictated by what other firms in the same or other industries have done or are expected to do, or by anticipations of changes in consumer tastes.

## Conclusions

This article has sought to clarify concepts of wastes and losses in food marketing, and to present some of the related economic concepts. The necessary research now underway represents an attempt to quantify and appraise the cost—in terms of resources and value—of past and prospective major changes in agriculture and in the marketing system involved in minimizing such wastes and losses. The study is planned to cover individual food groups and subgroups, as well as the total of all major foods.

Adequate quantity and value data by commodity group, especially as they relate to the corresponding total movement through marketing channels, would provide researchers in Government agencies, colleges and universities, and industry with a basis for evaluating (1) the relative cost of current changes aimed at reducing wastes and losses, and (2) the relative merits of research aimed at eventual accomplishment of this goal. The statistics developed would be useful also for estimating or checking the percentages currently used to estimate how much of the food at the primary distribution level reaches consumers at the retail level

